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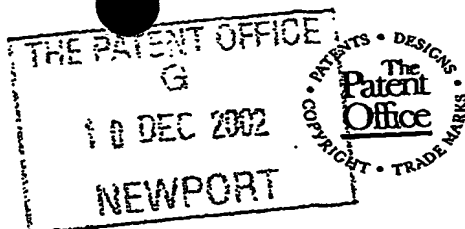
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# Patents Form 1/77

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## Request for grant of a patent

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10 DEC 2002

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1. Your reference	P30768-/LBA/GWI/GMU		
2. Patent application number (The Patent Office will fill in this part)	0228712.6		
3. Full name, address and postcode of the or of each applicant (underline all surnames)	Aqua Pharos International Limited Unit 4, Howard Court Nerston Industrial Estate East Kilbride G74 4QZ United Kingdom		
Patents ADP number (if you know it)	6762074002		
If the applicant is a corporate body, give the country/state of its incorporation	United Kingdom		
4. Title of the invention	Underwater Pool Light		
5. Name of your agent (if you have one)	Murgitroyd & Company		
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	Scotland House 165-169 Scotland Street Glasgow G5 8PL		
Patents ADP number (if you know it)	1198015		
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day / month / year)
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application		Date of filing (day / month / year)
8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	Yes		

# Patents Form 1/77

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Continuation sheets of this form

Description 18

Claim (s) -

Abstract -

Drawing (s) 10 + 10 *ll*

10. If you are also filing any of the following, state how many against each item.

Priority documents -

Translations of priority documents -

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*) -

Request for preliminary examination and search (*Patents Form 9/77*) -

Request for substantive examination (*Patents Form 10/77*) -

Any other documents (please specify) -

11. I/We request the grant of a patent on the basis of this application.

Signature *Murgitroyd & Co.* Date 9 December 2002  
Murgitroyd & Company

12. Name and daytime telephone number of person to contact in the United Kingdom GRAHAM MURNANE 0141 307 8400

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1     Underwater Pool Light

2

3     The present invention relates to an underwater pool  
4     light. In particular, but not exclusively, the  
5     invention relates to disposable underwater pool  
6     lights for use in swimming pools and spa baths,  
7     hereafter referred to as "pools".

8

9     Pools are conventionally built in one of four  
10    manners. The first method is to provide two spaced  
11    shutters formed from wood or steel, with steel  
12    reinforcing bars arranged between the shutters.  
13    Apertures are provided at a number of locations in  
14    one of the shutters and a niche for the pool light  
15    is located in each of the apertures. Typically, the  
16    niche is positioned such that a gap exists between  
17    the shutter and a flange member provided on the  
18    niche. Typically, conventional niches have to be  
19    modified so that they are fixed to the shutter by  
20    fastening, usually by screwing, a portion of the  
21    niche to the shutter. For steel shutters, which are

1 typically hired from a supplier, the cost of  
2 repairing or replacing the shutter is incurred.

3

4 Cement is poured between the shutters and allowed to  
5 set and then the shutters are removed. Finishers  
6 are then applied to the cement wall, including  
7 between the cement wall and flange of the niche.  
8 The finishers comprise render, adhesive and tiling,  
9 and the thickness of the finishers can range from 5  
10 to 45 millimetres. It is a difficult task, given  
11 this variation in thickness, for the pool builder to  
12 ensure that the finishers are flush against the  
13 flange member of the niche.

14

15 Another method of building the pool is to provide  
16 only one shutter and the reinforcing bars. The  
17 niches are suspended in position and concrete is  
18 sprayed onto the shutter, and around the niches, to  
19 form the concrete wall. The same problem exists for  
20 the pool builder when applying the finishers to  
21 ensure they are flush with the flange member of each  
22 niche.

23

24 A third method of building the pool is to clamp the  
25 lining of a flexible enclosure between two  
26 structural layers, typically made of metal, polymer  
27 or fibreglass. The two layers also clamp the flange  
28 member of each niche and apertures are cut into the  
29 material at each niche. A fourth method is to form  
30 a fibreglass enclosure in which apertures are cut  
31 for receiving each niche which is fastened to the  
32 fibreglass wall at the niche flange.

1

2 Conventional pool lights do not offer a means for  
3 adjusting the distance from visible parts of the  
4 pool light, such as the flange member, to the wall  
5 of the pool to accommodate variation in thickness of  
6 the finishers. Furthermore, no pool light presently  
7 exists which can be fitted to each of the four types  
8 of pools described above without modification by the  
9 pool builder.

10

11 Conventional pool lights use one or more separate  
12 replaceable bulbs in a housing. Electrical power is  
13 supplied via an insulated cable which enters the  
14 housing from the niche via an aperture. The  
15 aperture includes a permanent seal in order to  
16 prevent water entering the housing.

17

18 The housing is cooled by the water present in the  
19 space between the niche and the housing and also by  
20 the water in contact with the lens at the front of  
21 the housing. However, there is limited ability for  
22 water to flow within the niche. This can cause the  
23 accumulation of body fat from swimmers, which can be  
24 a health hazard as it encourages the growth of  
25 bacteria such as legionella.

26

27 When it is necessary to replace the bulb, or carry  
28 out any other maintenance to the unit, the housing  
29 must be removed from the niche and lifted out of the  
30 water. Typically the bulb has a life of around 250  
31 to 1,000 hours of use. Removal of the housing  
32 typically requires the removal of a number of

1 screws, which is a difficult task to carry out  
2 underwater, due to a lack of visibility and  
3 mobility. The cable is typically of sufficient  
4 length between the niche and the housing to allow  
5 the maintenance to be carried out at the side of the  
6 pool.

7  
8 An improved type of pool light would comprise a  
9 modular unit which includes a bulb in a cavity which  
10 is enclosed by a permanently sealed body. When  
11 replacement of a bulb for such a unit is necessary  
12 the entire unit is replaced. This type of pool  
13 light would therefore be disposable. Such a type of  
14 pool light would require a wet mateable electrical  
15 connection between the pool light and the power  
16 cable provided in the niche. Also, fittings would  
17 be required to prevent any maintenance or bulb  
18 replacement from being attempted.

19  
20 Conventional pool lights do not provide this wet  
21 mateable connection or suitable fittings. Such pool  
22 lights typically include male connectors which  
23 permit electrical arcing if the pool light is  
24 connected to the power cable underwater. Also, the  
25 male connectors often include a guide pin which is  
26 easily damaged.

27  
28 It is desirable that light from the pool light can  
29 project from the side wall and across at least half  
30 the width of a standard training pool, as well as  
31 achieving illumination of the bottom of the pool.  
32 In a typical swimming pool, an individual pool light

1 may be required to illuminate an area having a  
2 length of 6 metres from the unit, a width of 4  
3 metres (2 metres either side of the unit) and a  
4 depth of 2.4 metres from the unit to the base of the  
5 pool. It is undesirable and inefficient for the  
6 projected light to be projected upwards relative to  
7 the base of the pool.

8  
9 Conventional pool lights use a three dimensional  
10 parabola shaped reflector to reflect light that is  
11 projected from the bulb in a direction towards the  
12 rear of the housing. Conventional lens and  
13 reflector arrangements are not adapted to direct the  
14 radiation of light so that there is a greater  
15 proportion of radiation in a downwards direction.  
16 Also, the angle of illumination, in the plane of the  
17 base of the pool, is limited. Conventional lamps do  
18 not significantly hinder the radiation of light in  
19 an upwards direction. Dark regions can be present  
20 in the pool near to the junction of the base and  
21 side walls and at the side walls where the pool  
22 lights are situated.

23  
24 According to a first aspect of the present  
25 invention, there is provided an underwater pool  
26 light for fitting within or to a wall of the pool,  
27 the pool light comprising:

28 a housing having an opening;  
29 a light source located within the housing;  
30 a lens substantially covering the opening, the  
31 lens having a first portion adapted to direct light  
32 substantially normal to the wall of the pool, and a



1 second portion adapted to direct light substantially  
2 parallel to the wall of the pool; and

3 a reflector located within the housing and  
4 having a first portion which is substantially  
5 parabolic in vertical cross section and a second  
6 portion which is adapted to reflect light  
7 substantially towards the second portion of the  
8 lens;

9  
10 Preferably the second portion of the lens is  
11 provided at the internal surface of the lens.  
12 Preferably the second portion of the lens comprises  
13 a plurality of Fresnel members adapted to direct  
14 light substantially parallel to the wall of the  
15 pool. Preferably each Fresnel member includes an  
16 edge adapted to bend light so that it is  
17 substantially parallel to the wall of the pool. The  
18 second portion of the lens may be adapted to cause  
19 diffraction of light in a direction substantially  
20 parallel to the wall of the pool. The second portion  
21 of the lens may include a reflective surface to  
22 reflect light in a direction substantially parallel  
23 to the wall of the pool.

24  
25 Preferably each Fresnel member is arcuate and  
26 substantially concentric about the light source.  
27 Preferably the second portion of the lens is adapted  
28 to direct light downwards. Preferably the second  
29 portion of the lens is further adapted to direct  
30 light substantially horizontally in each direction.

31

1 Preferably the first portion of the reflector is  
2 substantially linear in horizontal cross section.

3  
4 Preferably the second portion of the reflector has a  
5 planar surface oriented to reflect light  
6 substantially towards the second portion of the  
7 lens. Preferably the second portion of the  
8 reflector is provided at an upper region of the  
9 reflector.

10  
11 Preferably the reflector includes a third portion  
12 which is adapted to reflect light substantially  
13 towards the second portion of the lens. Preferably  
14 the third portion of the reflector has a planar  
15 surface. Preferably the third portion of the  
16 reflector is provided at each side of the reflector.

17  
18 Preferably the pool light further comprises a  
19 shading member adapted to inhibit the radiation of  
20 light in at least one direction. Preferably the  
21 shading member is adapted to inhibit the radiation  
22 of light in an upwards direction.

23  
24 Preferably the shading member is positioned at the  
25 external surface of the lens. Alternatively the  
26 shading member is positioned at the internal surface  
27 of the lens. Preferably the shading member is press  
28 fit to the lens or housing.

29  
30 Preferably the shading member is positioned at an  
31 upper portion of the lens relative to the base of

1 the pool. Preferably the shading member is  
2 substantially oval.

3

4 According to a second aspect of the present  
5 invention there is provided an underwater pool light  
6 comprising:

7 a housing;

8 a niche for mounting the housing within or on  
9 the wall of a pool;

10 mounting means for mounting the housing to the  
11 niche, the mounting means comprising a component of  
12 the housing adapted to slideably engage with a  
13 component of the niche, such that the distance  
14 between the housing and the niche is selectively  
15 adjustable; and

16 clamping means for clamping the component of  
17 the housing relative to the component of the niche.

18

19 Preferably the mounting means is adapted such that  
20 the distance between the housing and the niche is  
21 infinitely adjustable over the adjustment length.

22

23 Preferably the component of the housing comprises  
24 one or more protrusions provided at the housing and  
25 the component of the niche comprises one or more  
26 slots provided at the niche. Preferably three  
27 protrusions and three slots are provided.

28 Preferably the or each protrusion includes a keyed  
29 portion which is complementary in profile to the  
30 profile of the slot.

31

1 Preferably the clamping means comprises at least one  
2 screw fastener.

3  
4 Preferably the pool light includes a lens and the  
5 component of the housing is provided at a lens  
6 holding member.

7  
8 Preferably the housing includes a collar projecting  
9 from a face of the housing. Preferably the collar  
10 has a projecting length of around 50 millimetres.  
11 The collar provides an edge up to which a pool  
12 builder may apply finishers to the pool wall. The  
13 collar may then be trimmed.

14  
15 Preferably the housing includes one or more cam  
16 receiving slots, and the lens includes one or more  
17 cammed members for pivotally locating the lens  
18 relative to the lens holding member. Preferably two  
19 cammed members are provided.

20  
21 Preferably the lens includes fastener locating means  
22 and a fastener for fastening the lens to the lens  
23 holding member. Preferably the fastener locating  
24 means comprises a hollow coned protrusion for  
25 aligning the lens to a fastener receiving aperture  
26 provided at the lens holding member. The cammed  
27 members and fastener locating means allow self  
28 alignment of the lens to the lens holding member.

29  
30 Preferably the housing includes a lamp enclosure  
31 which is sealably connected to the lens by a  
32 plurality of fasteners. Preferably the housing

1 includes a trim guard which covers the fasteners to  
2 prevent unfastening of the fasteners. Preferably  
3 the trim guard includes a plurality of pegs which  
4 are received in apertures provided at the lens. The  
5 trim guard prevents removal of the lens for  
6 replacement of the bulb or other maintenance of the  
7 pool light.

8  
9 Preferably the housing includes two or more openings  
10 for allowing the flow of water into and out of the  
11 niche. Preferably the openings are provided at the  
12 perimeter of the lens. Preferably the openings  
13 comprise a number of cut-outs or castlations  
14 provided at the perimeter of the lens.

15  
16 Preferably the housing includes a wet mateable  
17 connector for connecting to an electrical supply  
18 cable. Preferably the connector includes a cable  
19 receiving sleeve. Preferably the sleeve has a  
20 keyed portion which is complementary to a keyed  
21 portion provided at the cable. The keyed portions  
22 of the sleeve and cable allow correct insertion of  
23 the cable in the sleeve.

24  
25 Preferably the niche includes one or more brackets  
26 for receiving one or more fastening rods, such as  
27 screwed rod. Preferably the or each bracket is  
28 adapted to receive one or more fastening rods of a  
29 plurality of sizes. Preferably the or each bracket  
30 is adapted to receive fastening rods oriented  
31 vertically, horizontally, or obliquely relative to  
32 the base of the pool.

1

2 An embodiment of the present invention will now be  
3 described, by way of example only, with reference to  
4 the accompanying drawings, in which:

5

6 Fig. 1 is a side view of a pool light;

7

8 Fig. 2 is a front view of the pool light of Fig. 1;

9

10 Fig. 3 is a perspective exploded view of the pool  
11 light of Fig. 1;

12

13 Fig. 4 is a perspective front view of a lens of the  
14 pool light of Fig. 1;

15

16 Fig. 5 is a perspective rear view of the lens of  
17 Fig. 4;

18

19 Fig. 6 is diagrammatic side view of the pool light  
20 of Fig. 1;

21

22 Fig. 7 is the diagrammatic view of Fig. 6 showing  
23 the radiation of light;

24

25 Fig. 8 is a diagrammatic plan view of the pool light  
26 of Fig. 1;

27

28 Fig. 9 is the diagrammatic view of Fig. 8 showing  
29 the radiation of light;

30

31 Fig. 10 is a perspective view of a reflector of the  
32 pool light of Fig. 1;

1

2 Fig. 11 is a perspective front view of a bezel of  
3 the pool light of Fig. 1;

4

5 Fig. 12 is a perspective rear view of the bezel of  
6 Fig. 11;

7

8 Fig. 13 is perspective front view of a niche of the  
9 pool light of Fig. 1;

10

11 Fig 14 is a perspective rear view of a housing of  
12 the pool light of Fig. 1; and

13

14 Fig 15 is a perspective rear view of the niche of  
15 Fig. 13.

16

17 Referring to Figs. 1 to 3 there is shown a pool  
18 light 10 comprising a housing 20 which has a opening  
19 that is covered by a lens 30. A reflector 40 and a  
20 light source in the form of two bulbs 50 are housed  
21 within the housing 20. A trim guard 60 is fitted to  
22 the lens 30.

23

24 The housing includes a lamp enclosure 70 and lens  
25 holding member, or bezel 80, which is sealably  
26 connected to the lamp enclosure 70 using a number of  
27 gaskets 90.

28

29 A collar (not shown) may be provided as projecting  
30 from the inner circumference of the lamp enclosure  
31 70. This collar, typically of 50 millimetres  
32 length, provides an edge up to which a pool builder

1 may apply finishers to the pool wall. Once the  
2 finishers had been applied, the collar may then be  
3 trimmed so that its projecting edge is flush with  
4 the pool wall.

5  
6 The lamp enclosure 70 includes an electrical  
7 connector 100 for connection to a power supply cable  
8 110. Internal wiring (not shown) connects the  
9 connector 100 to the two bulbs 50.

10  
11 Fig. 5 is a rear view of the lens 30. The lens has  
12 a first portion 32 adapted to direct light in a  
13 direction substantially normal to the wall in which  
14 the pool light 10 is fitted. This direction is  
15 shown in Fig. 1 and is denoted as direction 'A'.  
16 The lens 30 also has a second portion which  
17 comprises a number of Fresnel members 34 which are  
18 adapted to direct light substantially parallel to  
19 the wall of the pool. This direction may be  
20 downwards which is shown in Figs. 1 and 2 as  
21 direction 'B'. The direction of light from the  
22 Fresnel members 34 may also be horizontal which is  
23 shown in Fig. 2 as direction 'C'. The direction of  
24 light may also be at an oblique angle lying anywhere  
25 between directions 'B' and 'C'. The Fresnel members  
26 34 are all provided within a lower region of lens  
27 30, and are arcuate and concentric about the bulbs  
28 50. Each Fresnel member 34 includes an edge 36  
29 which is adapted to bend light so that it is  
30 parallel to the pool wall.  
31



1 Light may reach the lens 30 directly from the bulbs  
2 50 or it may be reflected from the reflector 40.  
3 The reflector 40 is shown in Fig. 10, and its  
4 sectional profile is shown in Figs. 6 to 9. The  
5 reflector 40 has a first portion 42 which is  
6 substantially parabolic in vertical cross section  
7 and so reflects light in a direction substantially  
8 normal to the pool wall. The reflector 40 also has  
9 a second portion 44 which has a planer surface and  
10 is oriented to reflect light substantially towards  
11 the Fresnel members 34. Fig. 7 shows that a  
12 substantial amount of light is radiated in a  
13 direction normal to the pool wall. A significant  
14 proportion of light is also radiated downwards.

15  
16 As shown in Fig. 8, the first portion of the  
17 reflector is linear in horizontal cross section,  
18 rather than parabolic. The reflector 40 also  
19 includes a third portion 46 which has a planar  
20 surface and is oriented to direct light to the  
21 Fresnel members 34 so that the light is directed  
22 horizontally and parallel to the wall of the pool.  
23 The radiation of light can be seen in Fig. 9, and it  
24 can be seen that a significant proportion of light  
25 is radiated in a substantially horizontal direction.

26  
27 It is to be understood that the reflector 40 and  
28 Fresnel members 34 co-operate to provide a  
29 significant portion of light being directed in a  
30 direction parallel to the pool wall and that, if  
31 either feature were used individually, the effect  
32 would not be significant.

1  
2 The reflector is typically made from aluminium.  
3 Fig. 10 shows that an 'S' shape is stamped through  
4 the reflector wall at each side at a position near  
5 to the bulbs 50. This allows folding of the  
6 material within the 'S' shape to produce two legs to  
7 hold each bulb 50 while providing an aperture for  
8 receiving each bulb 50 and allowing access to  
9 electrical wiring.  
10  
11 As seen in Fig. 2, the trim guard 60 includes a  
12 shading member 62 positioned at an upper region of  
13 the lens 30. The shading member 62 is oval and  
14 opaque and so inhibits the radiation of light in an  
15 upwards direction.  
16  
17 Referring to Fig. 4, the trim guard 60 is fitted to  
18 the lens 30 using alternate holes 38 provided in the  
19 lens 30. The rear of the trim guard 60 includes  
20 pegs (not shown) for press fitting into the holes  
21 38. The remaining holes 39 of the lens 30 are used  
22 for connection of the lens 32 to the lamp enclosure  
23 70.  
24  
25 The pool light 10 includes a niche 120 for mounting  
26 the pool light 10 within the wall of the pool.  
27 Mounting means are provided for mounting the housing  
28 20 to the niche 120. The mounting means comprises a  
29 component of the housing, in the form of three  
30 protrusions 82 provided at the rear of the bezel 80,  
31 which are adapted to slidably engage with a  
32 component of the niche, in the form of corresponding

1 slots 122 provided at the niche 120. The bezel 80  
2 and niche 120 are shown in Figs. 11 to 13. The  
3 mounting means allows the distance between the  
4 housing 20 and niche 120 to be selectively adjusted.  
5 Clamping means, in the form of screw fasteners (not  
6 shown) are provided for clamping the protrusions 82  
7 at the selected position in the slots 122.

8  
9 The bezel 80 includes two cam receiving slots 84 (as  
10 shown in Fig. 11) for receiving the cammed members  
11 86 provided at the lens 30 (as shown in Fig. 4).  
12 The lens 30 may conveniently be fitted to the bezel  
13 80 by locating the cammed members 86 in the cam  
14 receiving slots 84 and pivoting the upper region of  
15 the lens 30 towards the bezel 80. The lens 30  
16 includes fastener locating means in the form of a  
17 hollow coned protrusion 24 provided at the rear of  
18 the lens 30. The coned profile of the protrusion 24  
19 assists to align the protrusion 24 in a fastener  
20 receiving aperture 88. A fastener such as a screw  
21 (not shown) may be inserted through the coned  
22 protrusion 24 and screwed within the aperture 88 to  
23 hold the lens 30 to the bezel 80. The cammed  
24 members 86, fastener locating means, and the use of  
25 only one fastener allow easier aligning and  
26 fastening of the lens 30 to the bezel 80.

27  
28 Fig. 4 shows that the lens 30 includes a number of  
29 openings or castlations 26 provided at the perimeter  
30 of the lens 30. These castlations 26 allow the flow  
31 of water into and out of the niche 120.

32

1 Fig. 14 shows the electrical connector 100 of the  
2 housing 20 for connection to a power supply cable, a  
3 portion of which is shown in the figure. The  
4 connector is wet mateable in the sense that the pool  
5 light 10 may be connected to the power cable 110  
6 under water.

7  
8 The connector 100 includes a cable receiving sleeve  
9 102. This sleeve 102 includes a keyed portion 104  
10 which is complementary to a keyed portion 112 of the  
11 cable 110. These keyed portions 104, 112 permit  
12 insertion of the cable 110 into the sleeve 102 in  
13 one orientation only, thereby ensuring correct  
14 insertion of the cable 110.

15  
16 Fig. 15 shows that the niche 120 includes a number  
17 of brackets 124 for receiving fastening rods, such  
18 as screwed rod 126. The screwed rod 126 is  
19 typically of the standard size such as M6 or M8, and  
20 the brackets are adapted to receive more than one  
21 size of screwed rod 126. The brackets 124 are  
22 adapted to receive screwed rod 126 which is  
23 vertically or horizontally oriented. This allows  
24 the vertical position of the pool light 10 to be set  
25 during installation.

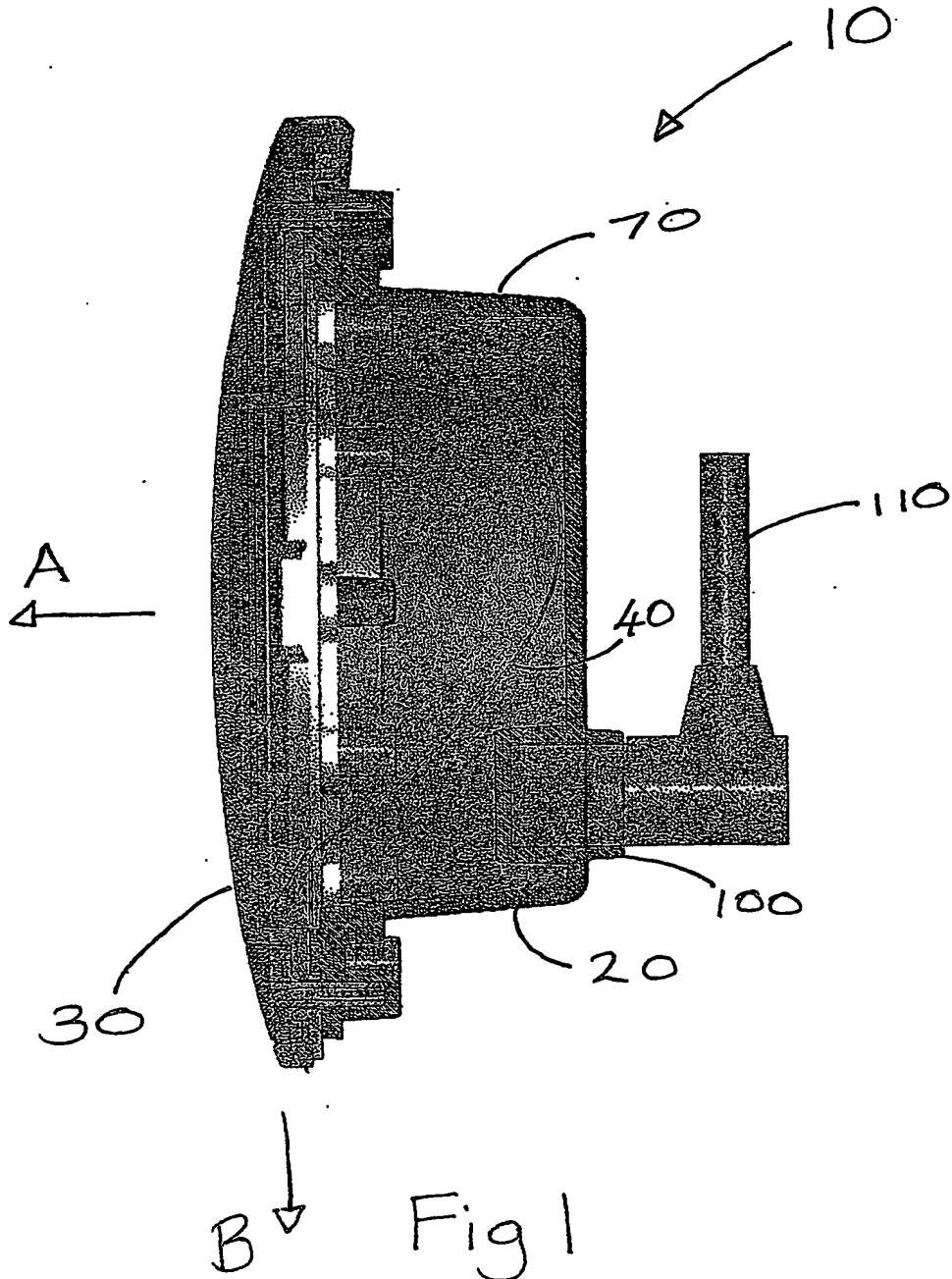
26  
27 The present invention may be used for any of the  
28 four methods of pool building without any further  
29 modification.

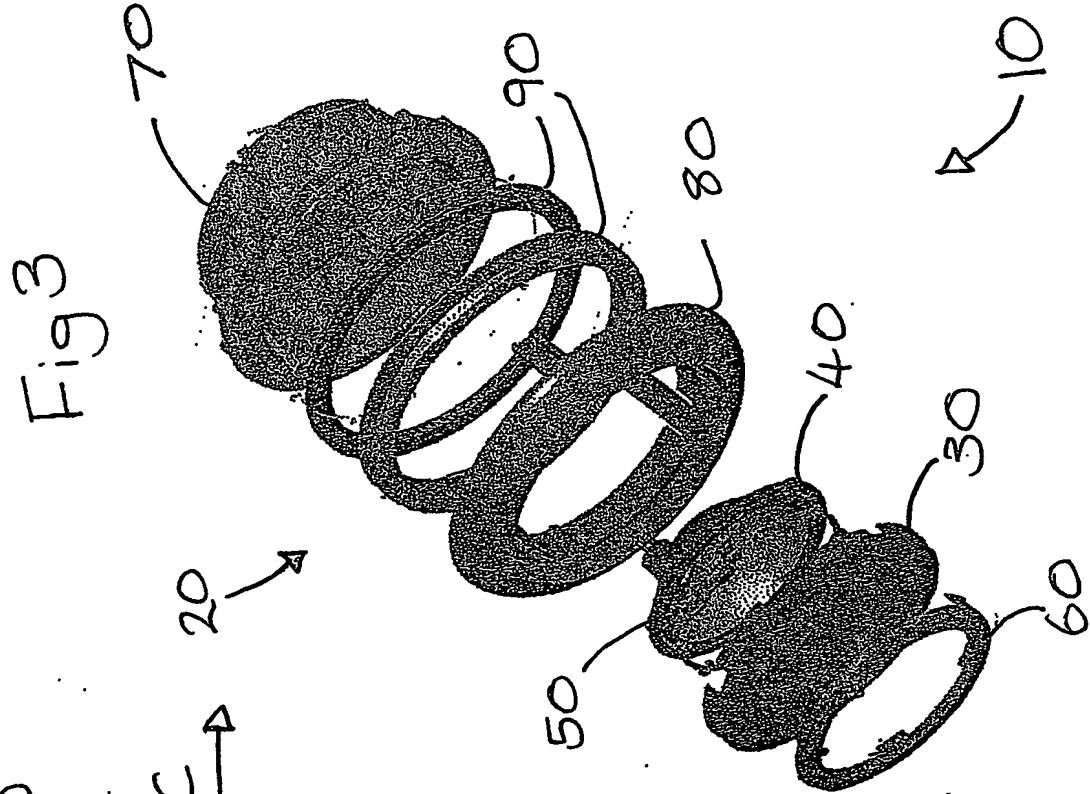
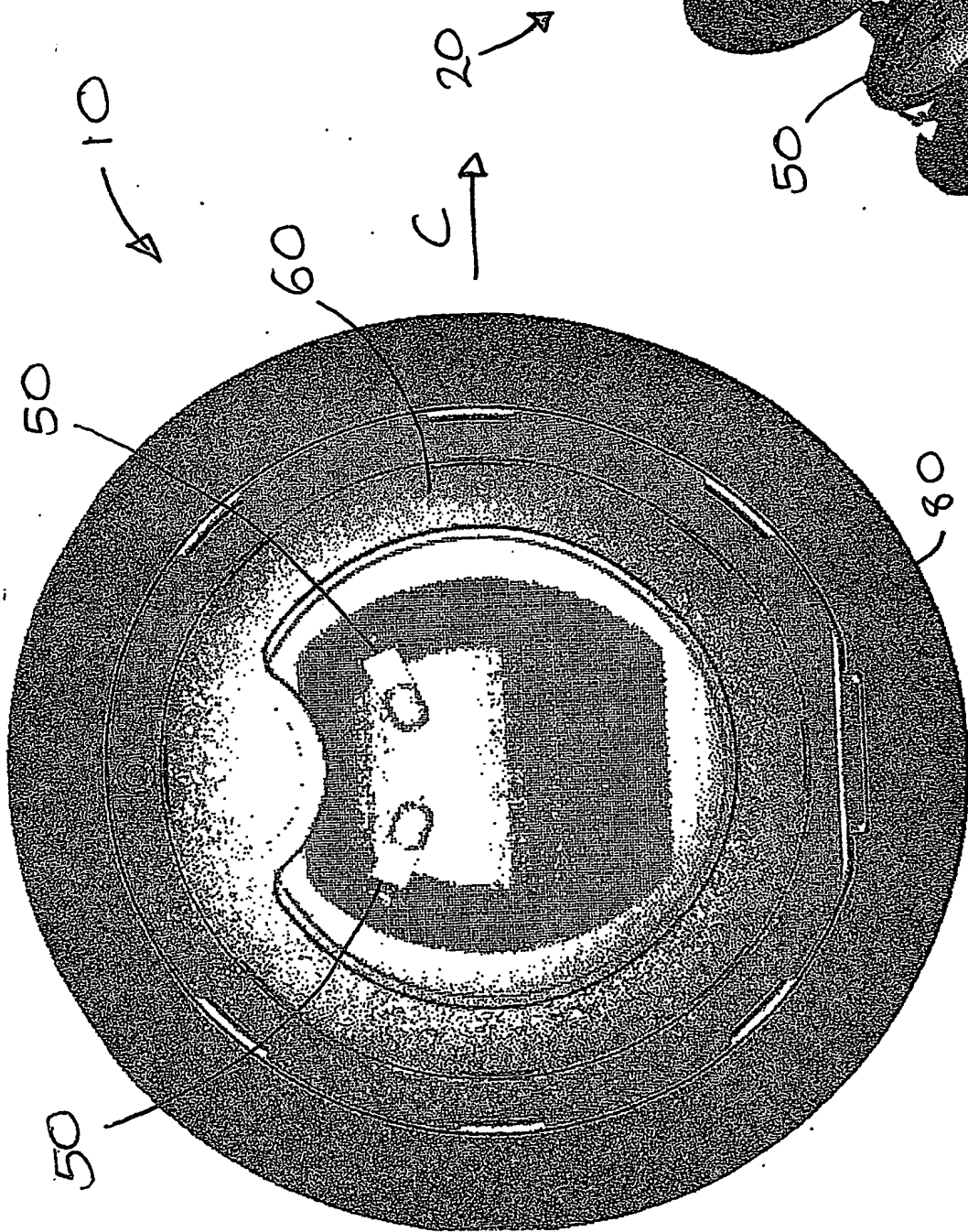
30

1 Various modifications and improvements can be made  
2 without departing from the scope of the present  
3 invention.

4

5





3/10

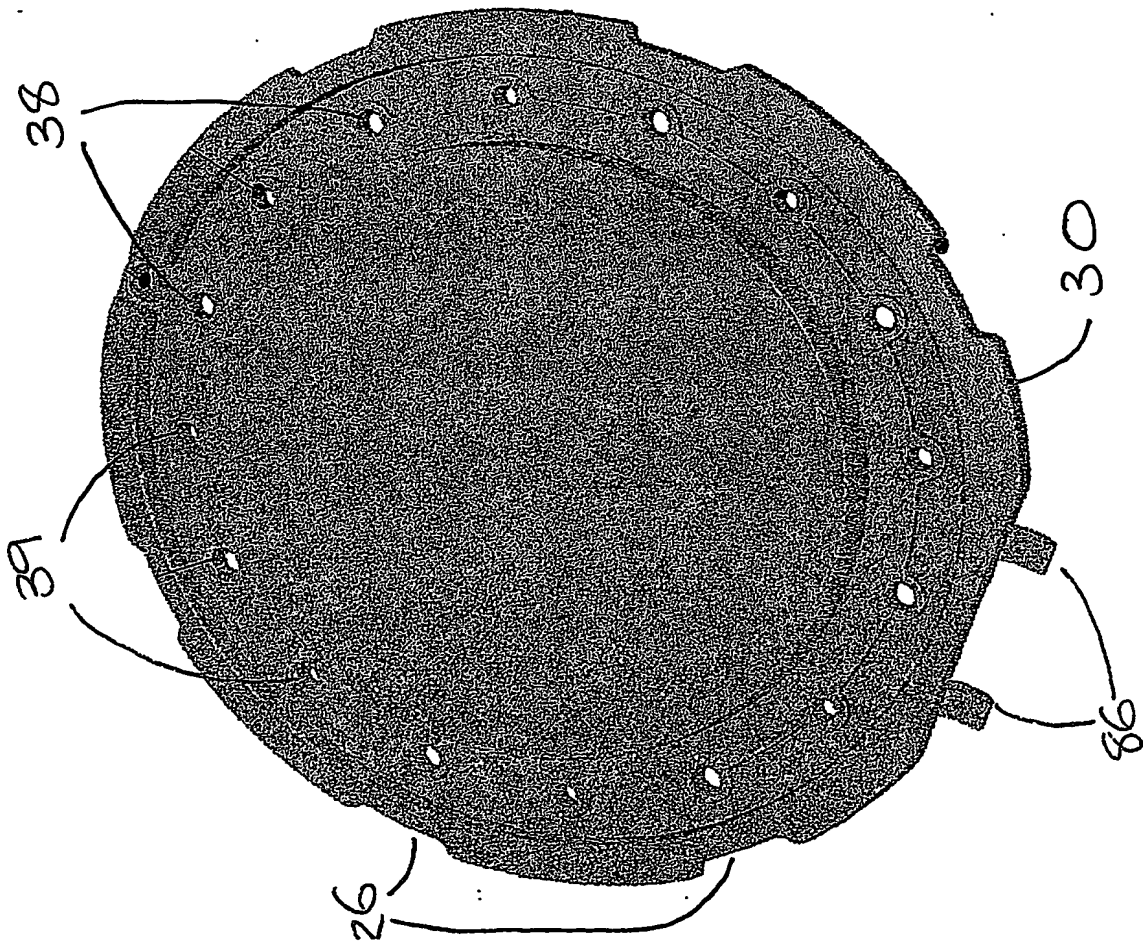


Fig 4

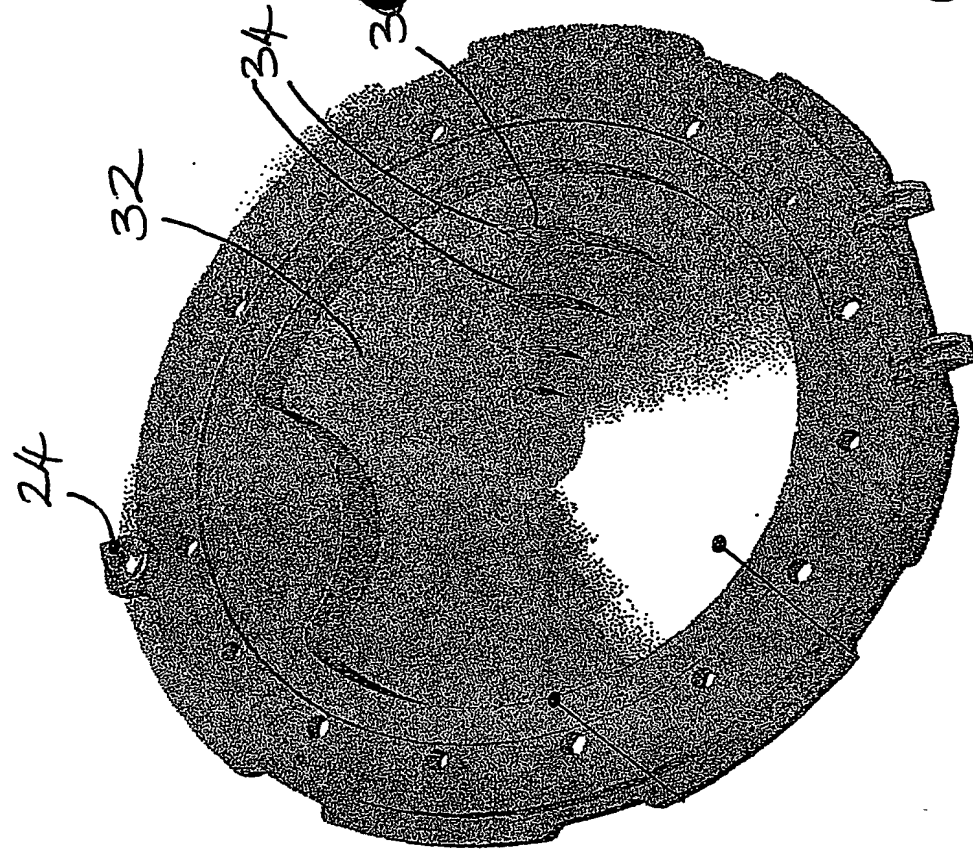


Fig 5



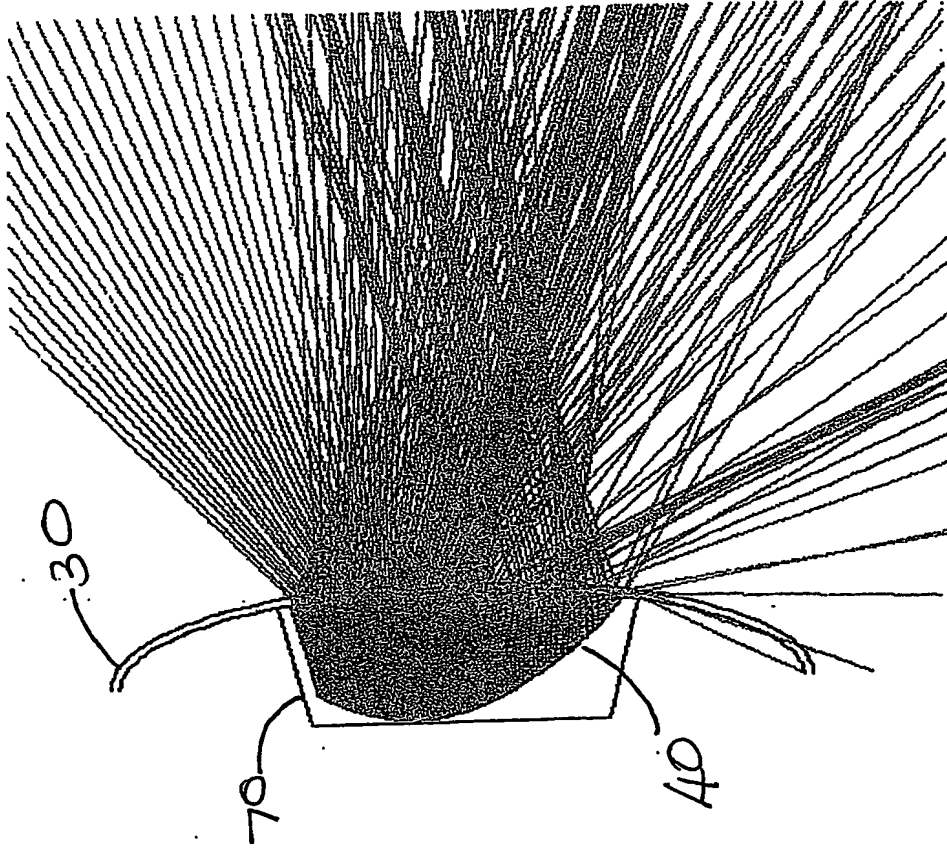


Fig 7

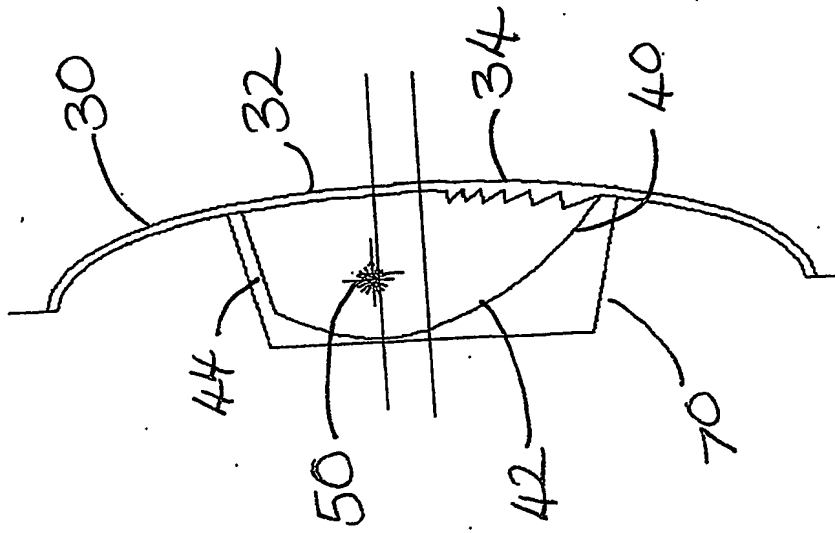


Fig 6

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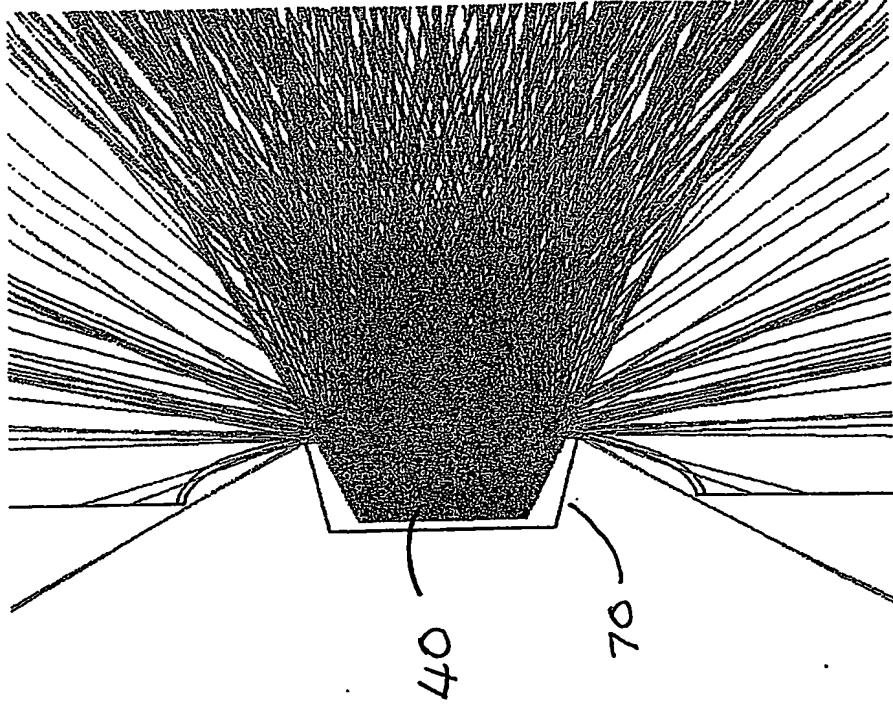


Fig. 9

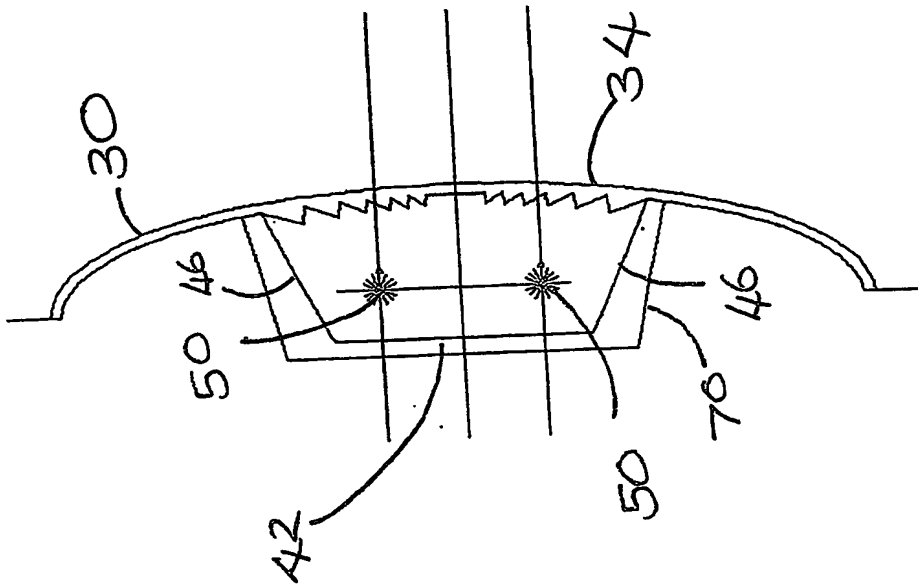


Fig. 8

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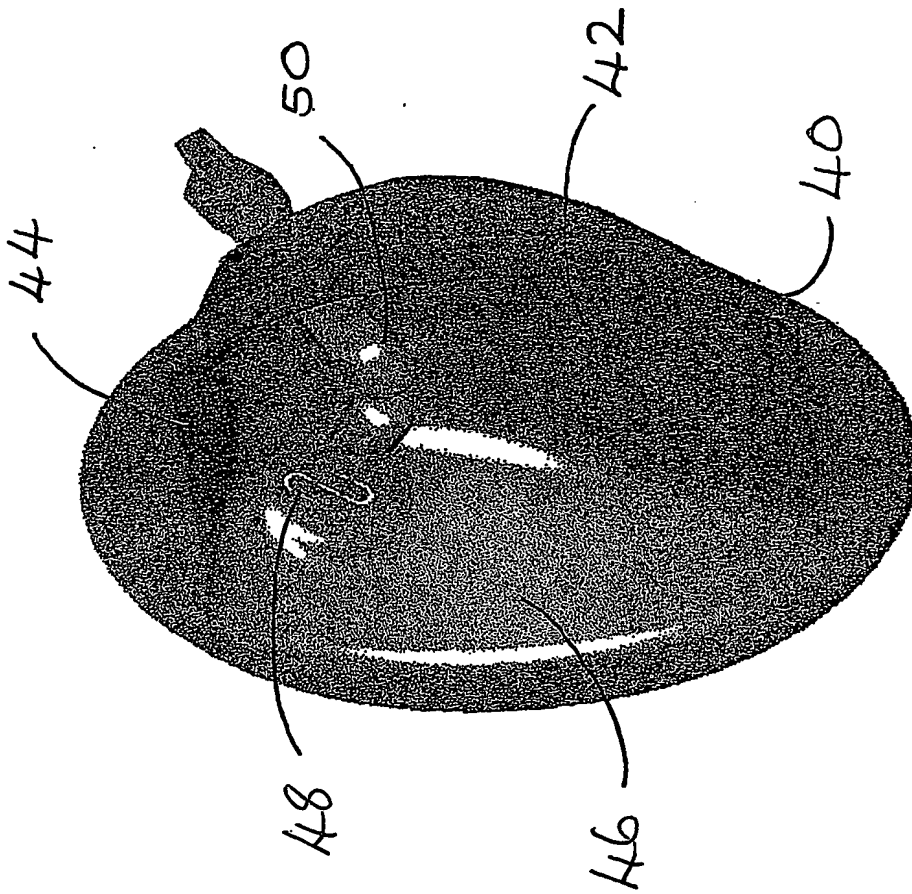


Fig 10

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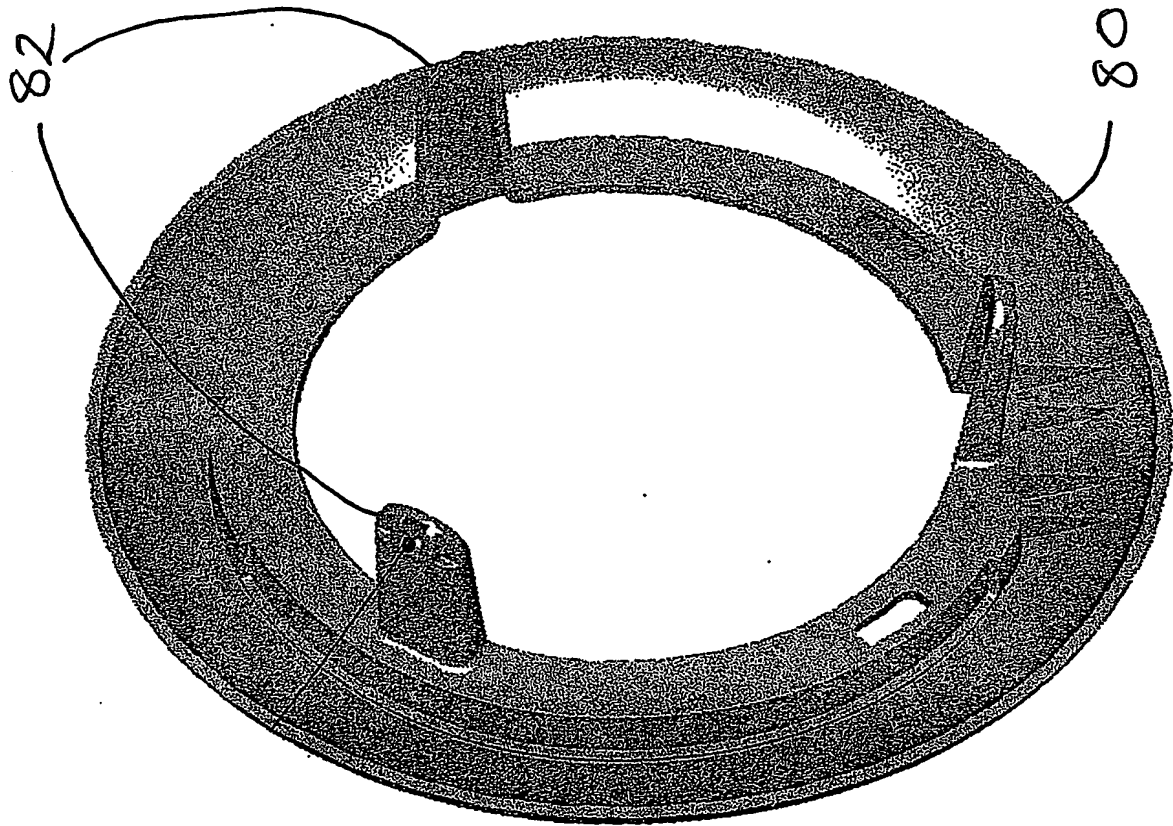


Fig 12

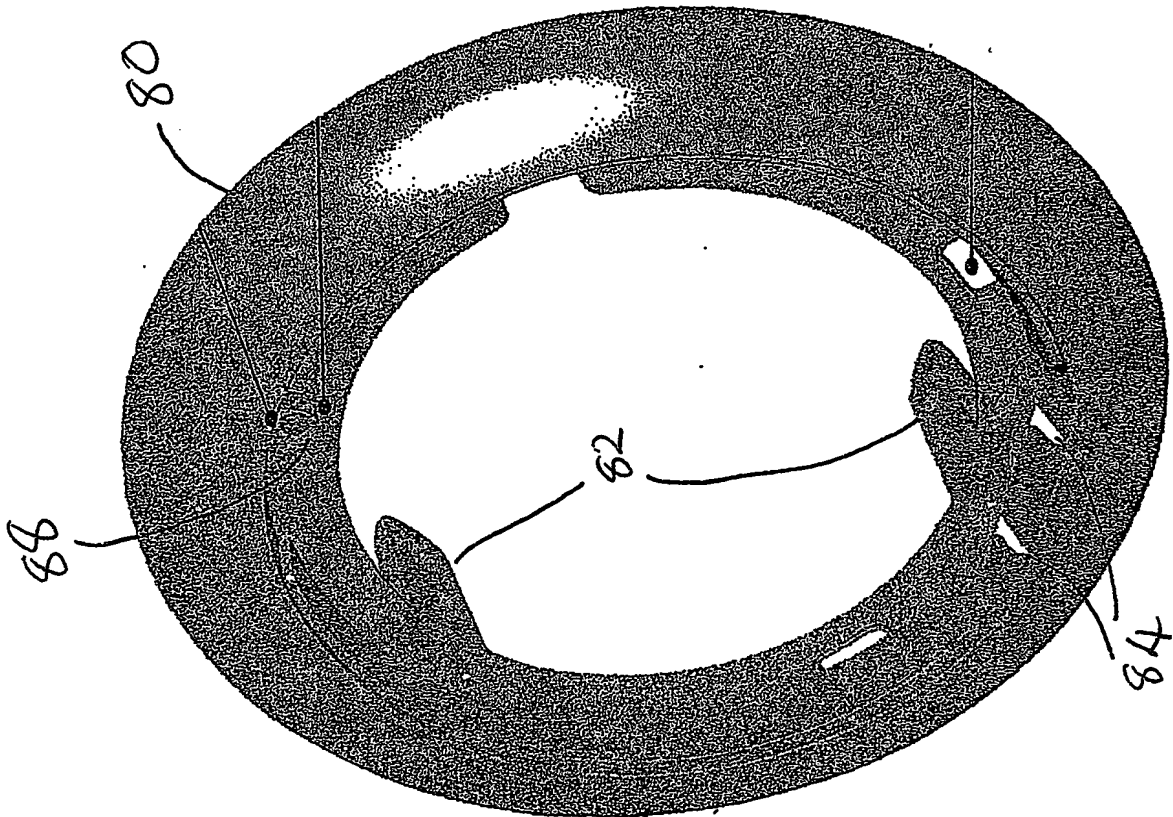


Fig 11

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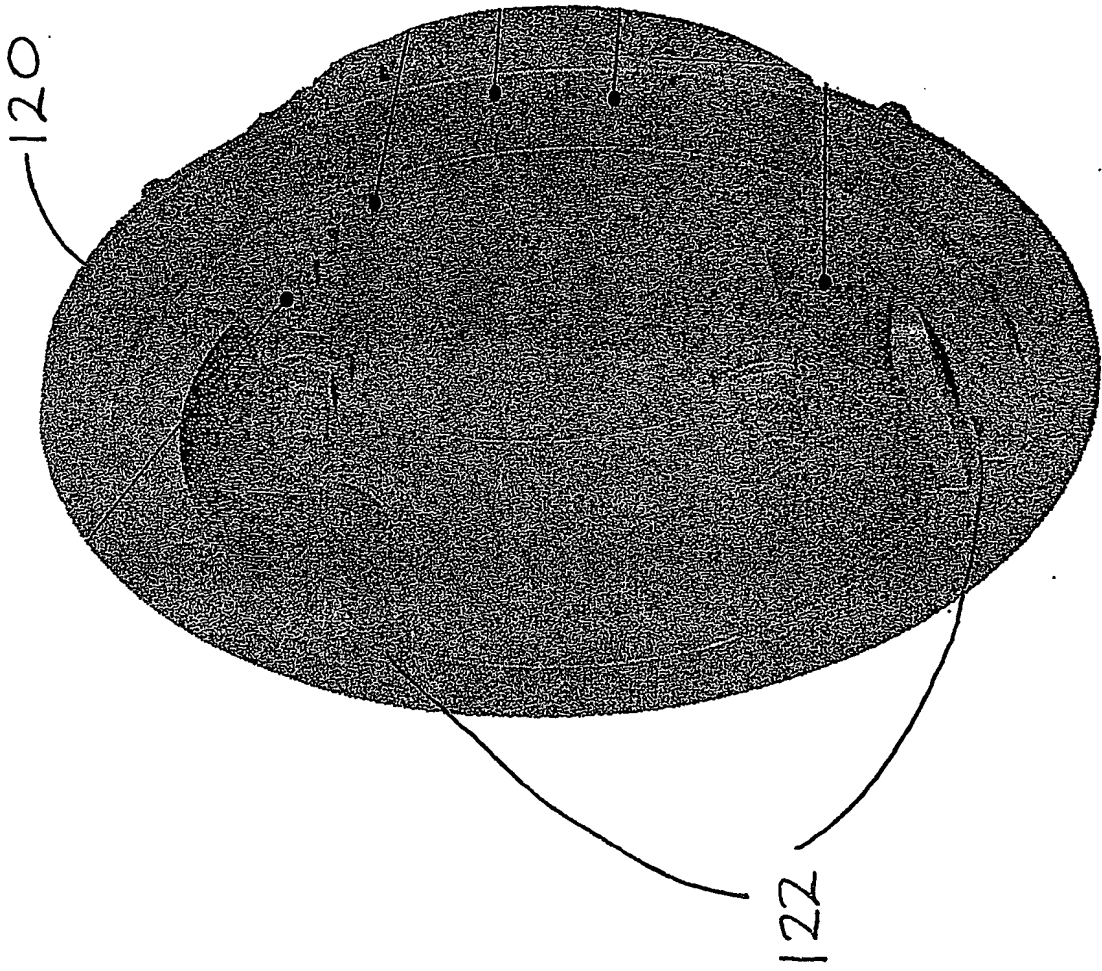


Fig 13

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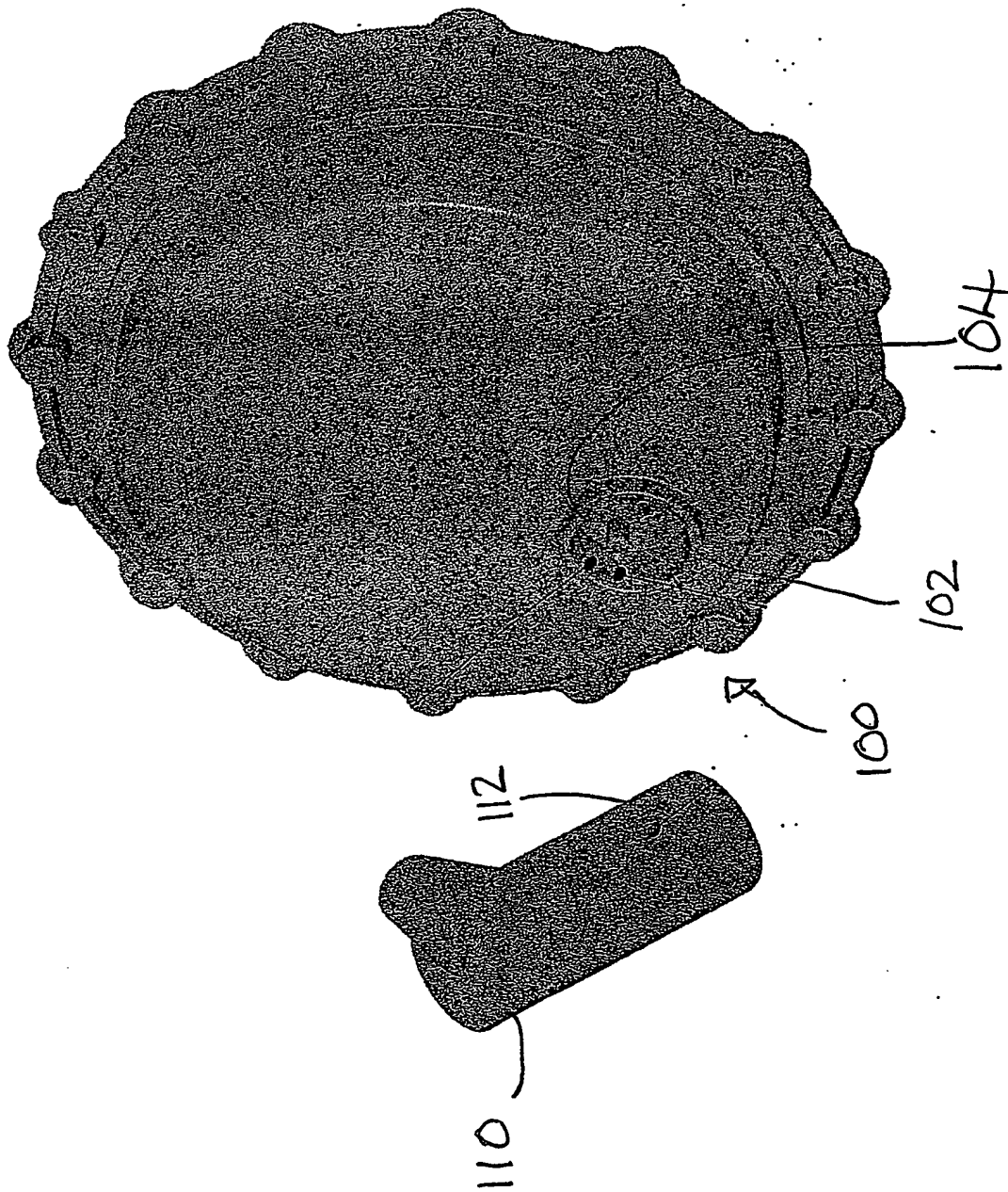


Fig 14

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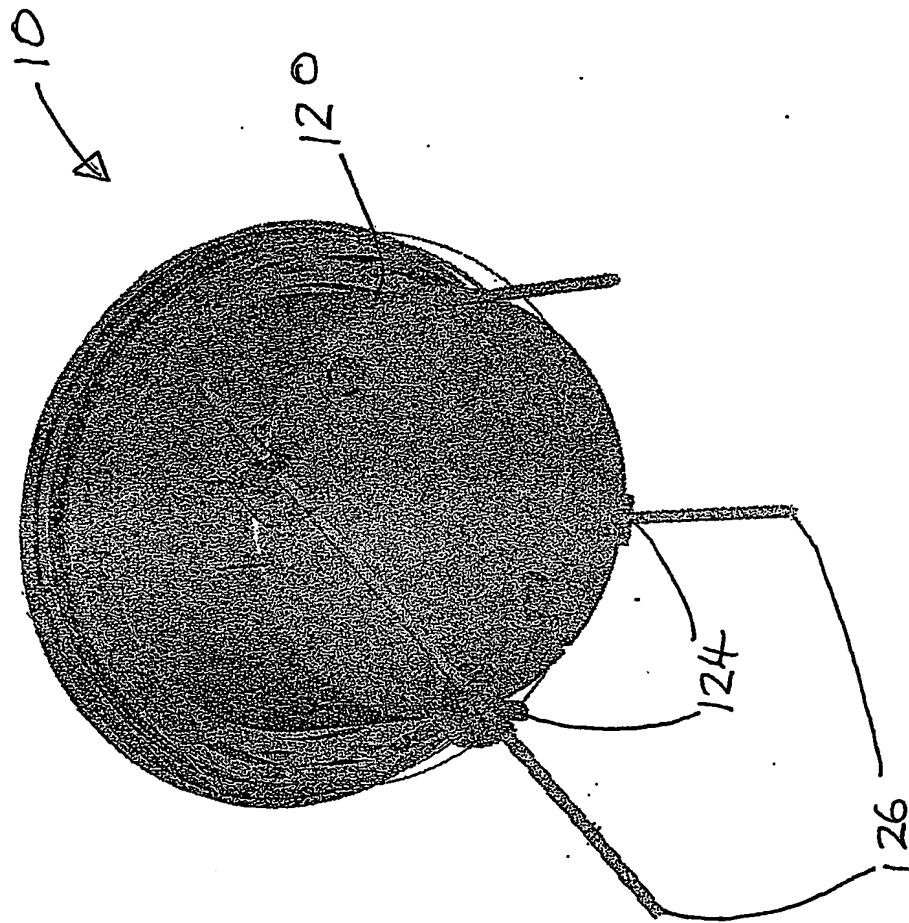
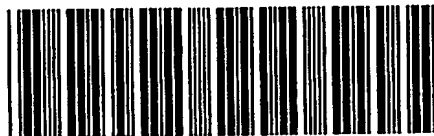


Fig 15

PCT Application

**GB0305305**





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